

Pirates Cove Beach, Rye

BEACH WATER QUALITY REPORT

SUMMER 2006



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BACKGROUND

The New Hampshire Department of Environmental Services (DES) has operated a Public Beach Inspection Program, or Beach Program, for over 20 years. An established coastal beach monitoring program began in 1989 and the program continues to provide monitoring on a weekly basis. DES recognizes the health threat at public beaches. As a result, increased beach monitoring and bacteria source tracking have been implemented to further protect public health.

Coastal beaches are monitored for the presence of the fecal bacteria *Enterococci*. These fecal bacteria are present in the intestines of warm-blooded animals including humans. Fecal bacteria, when present in high concentrations and ingested, can commonly cause gastrointestinal illnesses such as nausea, vomiting and diarrhea. They are also known as indicator organisms, meaning their presence in water may indicate the presence of other potentially pathogenic organisms.

In October of 2000, the United States Environmental Protection Agency (EPA) signed into law the Beaches Environmental Assessment and Coastal Health (BEACH) Act. The BEACH Act is an amendment to the Clean Water Act, which authorizes the EPA to award grants to eligible states. The purpose of the BEACH Act is to reduce the risk of disease to users of the nation's recreational waters. BEACH Act grants provide support for development and implementation of monitoring and notification programs that help protect the public from exposure to pathogenic microorganisms in coastal recreation waters.

DES received grant funding in 2002 to develop and implement a beach monitoring and notification program consistent with EPA's performance criteria requirements published in the *National Beach Guidance and Required Performance Criteria for Grants* document (www.epa.gov/waterscience/beaches/grants). DES has successfully met all requirements and continues to expand the monitoring and notification program. In 2002, only nine coastal beaches were monitored, while in 2003 and 2004, 15 and 16 beaches respectively, were monitored on a routine basis. Fifteen beaches were sampled again in 2005 and 2006. In 2004, volunteers sampled Star Island beach, but circumstances did not allow for this cooperative effort in 2005 and 2006.

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Beach Description

Pirates Cove is owned and maintained by the Town of Rye, New Hampshire. Pirates Cove Beach has a soft sand substrate with a total length of 3,110 feet. The beach is frequently used by residents for various recreational activities. There are two access points to the beach area from the parking lots off of Route 1A (Figure 1). Lifeguards are present and toilet facilities are available throughout the summer.

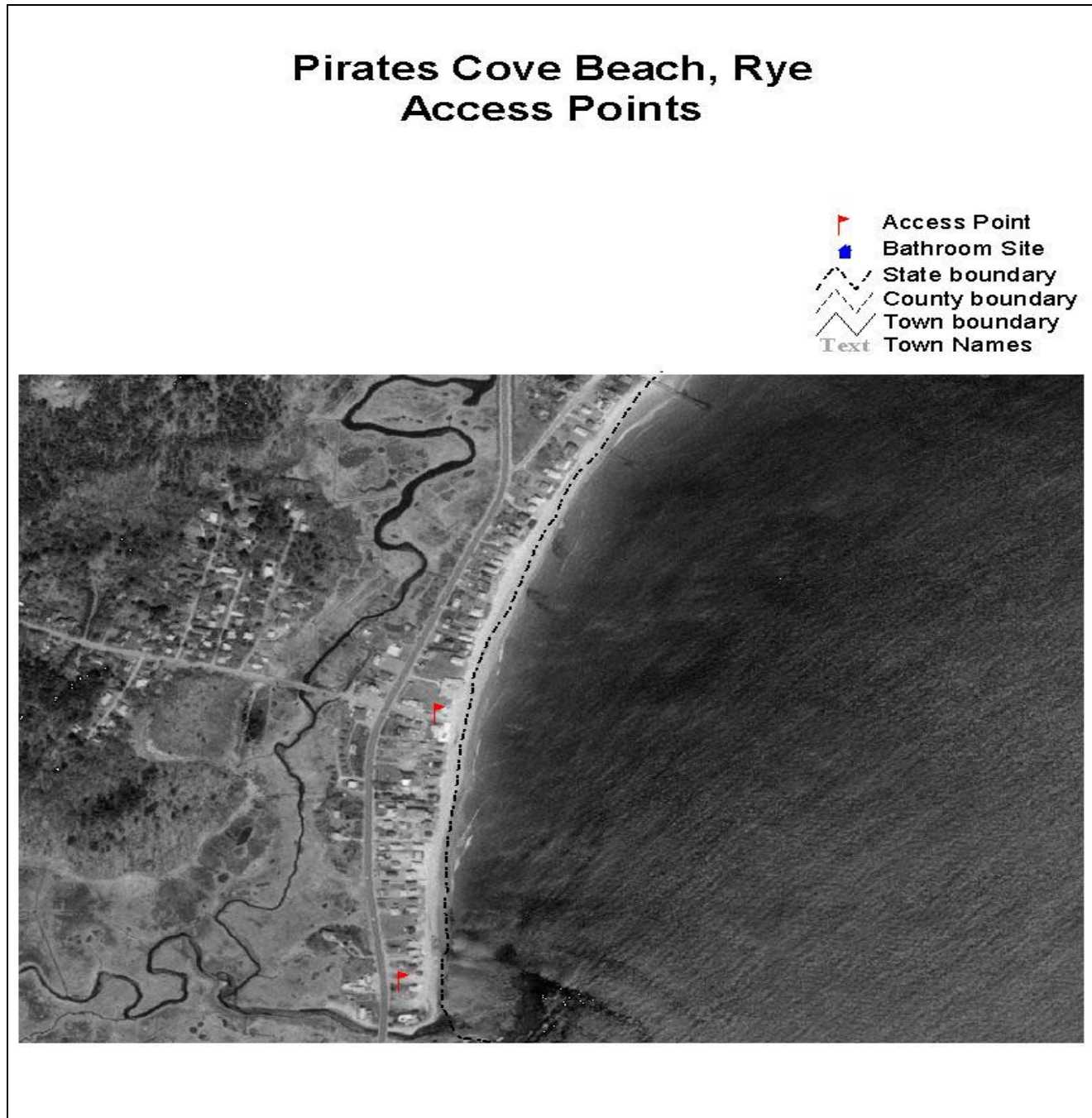


Figure 1. Pirates Cove Beach Access Points and Restroom Facilities

Gulls, usually observed in low numbers, are the waterfowl most frequently observed at the beach. Dogs are restricted from beach access during operating hours; however, they are permitted before and after regular beach hours.

Below is a brief description of the sampling stations at Pirates Cove Beach, Rye. The stations are pictured in Figure 2.

Table 1. Station Descriptions

Description	Latitude	Longitude
Left sample station: accessed from Wallis Sands State Park. Cross the rock wall separating Wallis Sands and Pirates Cove on the north end. The sample is collected three houses south of the wall.	43° 1' 35.0735"	-70° 43' 45.435"
Center sample station: accessed from the main beach entrance. Park in the main parking lot for the beach off of Route 1A next to the Rye Surf Club. Walk straight out and collect sample.	43° 1' 18.1467"	-70° 43' 55.255"
Right sample station: accessed from a small beach access area off of Route 1A. Park at the access located across from Petey's Restaurant and immediately after a small bridge. Enter the beach, turn north and walk to the sixth house. Collect the sample in front of the house.	43° 1' 6.8875"	-70° 43' 57.2174"
Parson's Creek sample: accessed via the parking area used for the right sample. Walk to the beach and turn south towards Parson's Creek. Samples are usually collected only during low tide because at high tide the water may be flowing upstream	43° 1' 0.013"	-70° 43' 0.974"

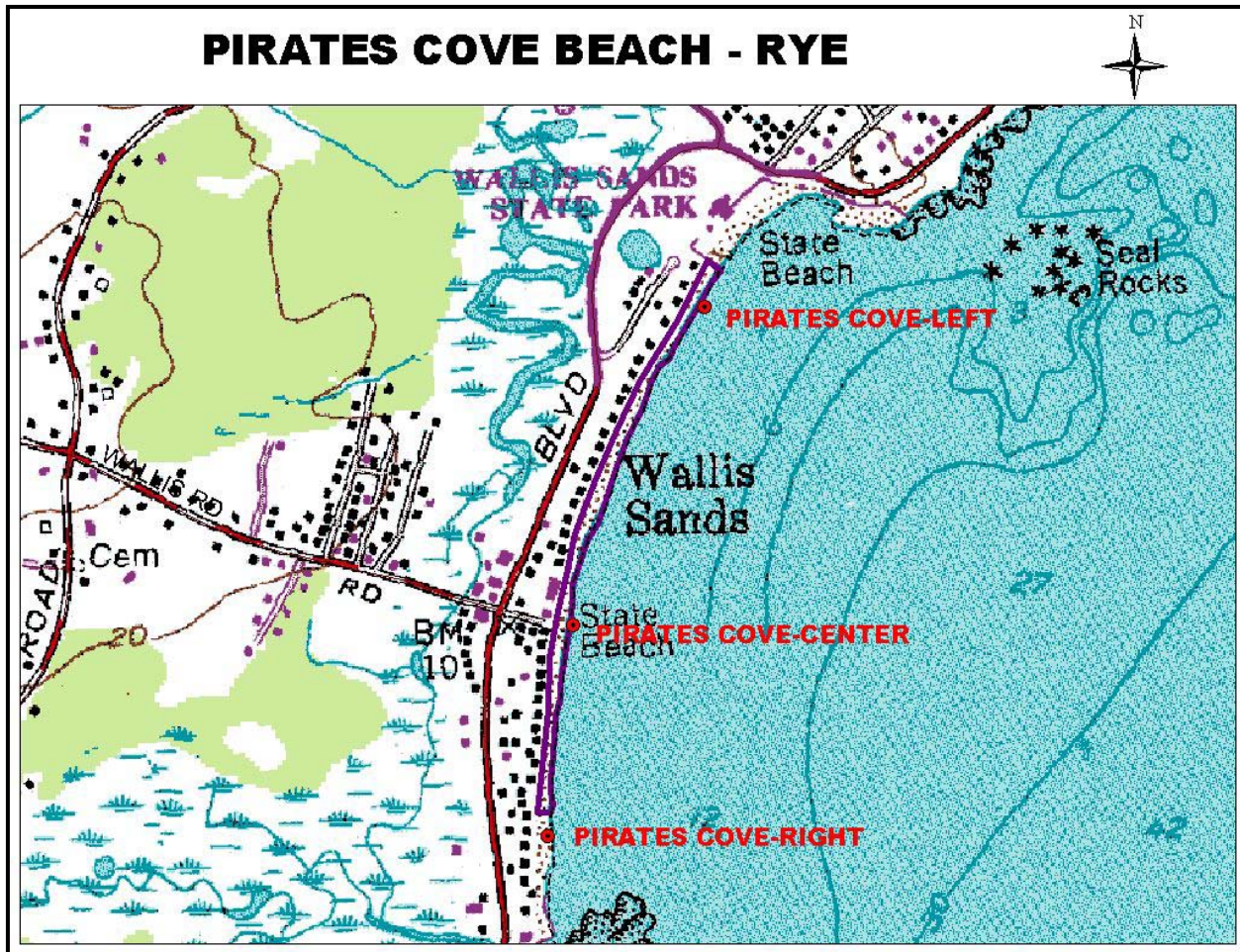


Figure 2. Map of Pirates Cove Beach

Tier Status and Sampling Frequency

The Beach Program developed a risk-based beach evaluation process and tiered monitoring approach and implemented this approach during the 2003 beach season. Beach evaluations are conducted annually to determine potential health threats to the public. Evaluations are based on several criteria in three main categories: beach history, microbial pathogen sources, and beach use. The evaluations for the 2006 season included a new criterion to assess beaches. Beaches are now assessed as impaired for bacteria. Impairments are based the most recent version of the Consolidated Assessment and Listing Methodology (CALM) submitted to EPA by DES every two years. The CALM assesses beach units as impaired based on historical exceedances of both the single sample and geometric mean bacteria standards.

Based on these criteria, beaches were assigned a Tier I-Impaired, Tier I or Tier II status in 2006. Tier I-Impaired beaches are high priority and have an increased potential to affect public health, Tier I are medium priority, while Tier II are low priority beaches that have less potential to affect public health. Beach sample frequency is based on the Tier statuses; Tier I-Impaired beaches

were sampled twice per week, Tier I beaches were sampled once per week, and Tier II beaches were sampled once every other week in 2006.

Pirates Cove is a Tier I beach. It was categorized as a Tier I beach based on the Beach Program's Risk-Based Evaluation ranking system. This ranking indicates that there is frequent beach use, as compared to other coastal beaches. The beach ranking has not changed since this system was implemented in 2002. Because Pirates Cove is a Tier I beach, samples are collected once per week.

Current Year Water Quality

Beaches are monitored to ensure compliance with State Water Quality Standards. Marine waters are analyzed for the presence of the fecal bacteria *Enterococci*. *Enterococci* are known as indicator organisms, meaning their presence may indicate the presence of other pathogenic organisms. The state standard for *Enterococci* at public beaches is 104 counts/100 mL in one sample, or a geometric mean of 35 counts/100 mL in three samples collected over 60 days. Standard exceedances require the issuance and posting of a beach advisory. Beach advisories remain in effect until subsequent beach sampling indicates safe water quality conditions.

The number of samples collected at each beach is a function of beach length. Beaches less than 100 feet in length are sampled at left and right locations 1/3 of the distance from either end of the beach. Beaches greater than 100 feet in length are bracketed into thirds and sampled at left, center and right locations. Routine sample collection may be enhanced by sampling known or suspected pollution sources to the beach area. Storm event sampling may be conducted at beaches where wet-weather events are expected to affect beach water quality.

The 2006 season's weather can best be described as unpredictable. The sampling season began on May 30. During the month of May, New Hampshire experienced flood conditions typical of a 100-year flood, while the months of June and July were wetter and warmer than normal, and August was unseasonably cool and dry. May had over 17 inches of rain setting a record high for the month, and over eight inches of rain fell during June (as recorded at Pease International Tradeport, Portsmouth, N.H.). Precipitation was recorded on 34 days of the 95 day sampling season. Twenty-two beach days (beach hours 9:00a.m. to 5:00p.m.) were directly affected by precipitation. There were a total of 15 routine inspections performed and 45 samples collected in 2006.

Table 2 includes the *Enterococci* data from each sampling event in 2006. Overall, the summer 2006 *Enterococci* levels were below the state standard for public beaches (Figure 3). A beach advisory was issued on July 13. Over 1.5" of rain fell prior to sample collection. The storms caused a surge in bacteria from Parson's Creek to be washed into the beach area. Parson's Creek discharge negatively impacts beach water quality after significant rain events. Beach bacteria levels were within the state's water quality standards for designated beaches by July 17 and the advisory was removed. *Enterococci* levels were below the state standard for the remainder of the season.

Table 2. Pirates Cove Beach Enterococci Data 2006

Sample Date	Station Name	Enterococci Results (counts per 100 mL)
6/1/2006	Left	10
	Center	10
	Right	10
6/5/2006	Left	10
	Center	10
	Right	20
6/14/2006	Left	10
	Center	10
	Right	20
6/20/2006	Left	10
	Center	10
	Right	20
6/26/2006	Left	10
	Center	10
	Right	10
7/6/2006	Left	10
	Center	5
	Right	10
7/12/2006	Left	10
	Center	120
	Right	480
7/13/2006	Left	180
	Center	10
	Right	330
7/17/2006	Left	5
	Center	10
	Right	30
7/26/2006	Left	10
	Center	5
	Right	20
8/1/2006	Left	10
	Center	10
	Right	10
8/7/2006	Left	10
	Center	5
	Right	10
8/17/2006	Left	10
	Center	10
	Right	10
8/22/2006	Left	10
	Center	10
	Right	10
8/28/2006	Left	10
	Center	10
	Right	10

Figure 3 depicts the relationship between Enterococci data at Pirates Cove Beach and the state standard for coastal beaches.

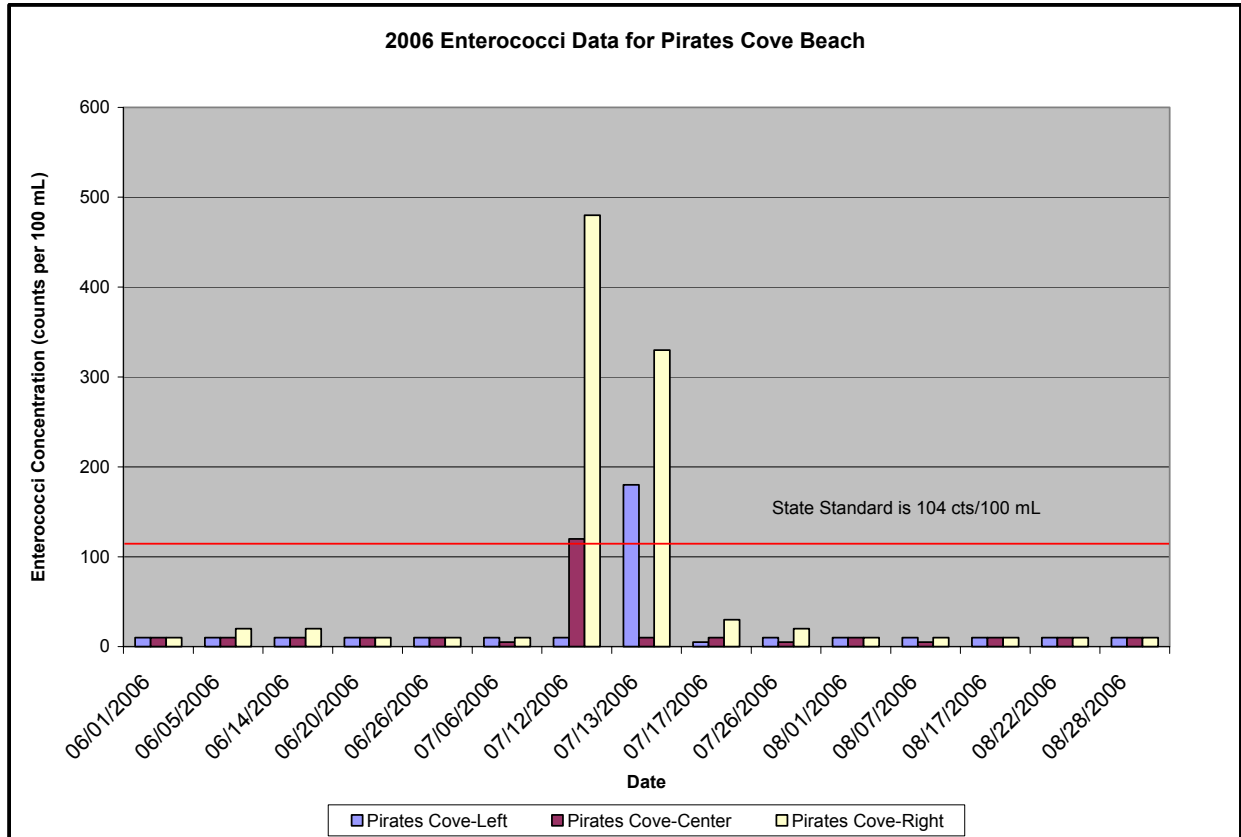


Figure 3. Pirates Cove Beach Enterococci Data 2006

Enterococci levels at Parson's Creek were elevated on several occasions this season (Table 3 and Figure 4). Samples were collected during low tide conditions and when creek flow was directed towards the beach. Figure 5 depicts Parson's Creek Enterococci levels compared with precipitation. Enterococci levels appear to elevate after precipitation events of 0.5 inches or greater. Parson's Creek is a known bacterial pollution source to the Atlantic Coast. Parson's Creek discharge is the suspected source of elevated Enterococci counts at the right sample station on July 12 and 13.

DES has conducted two studies on Parson's Creek to identify the sources of bacterial pollution. The studies employed the microbial source tracking technology called "ribotyping". The technology results in source specific identification such as humans, dog, or geese fecal sources. Both studies indicate that wild animals and humans are significant sources of bacterial pollution to the creek. The human sources may be the result of suspected failed septic systems. The Watershed Assistance Section, Coastal Investigations, identified a failing system along Parson's Creek and worked with the town to have the system replaced. They suspect additional failures, but have not found any obvious signs during site walks.

Table 3. Parson's Creek Enterococci Data 2006

Sample Date	Enterococci Results (counts per 100 mL)
6/1/2006	10
6/14/2006	80
6/20/2006	20
7/17/2006	240
7/26/2006	140
8/1/2006	140
8/17/2006	20
8/28/2006	280

Figure 4 depicts Enterococci data collected from Parson's Creek.

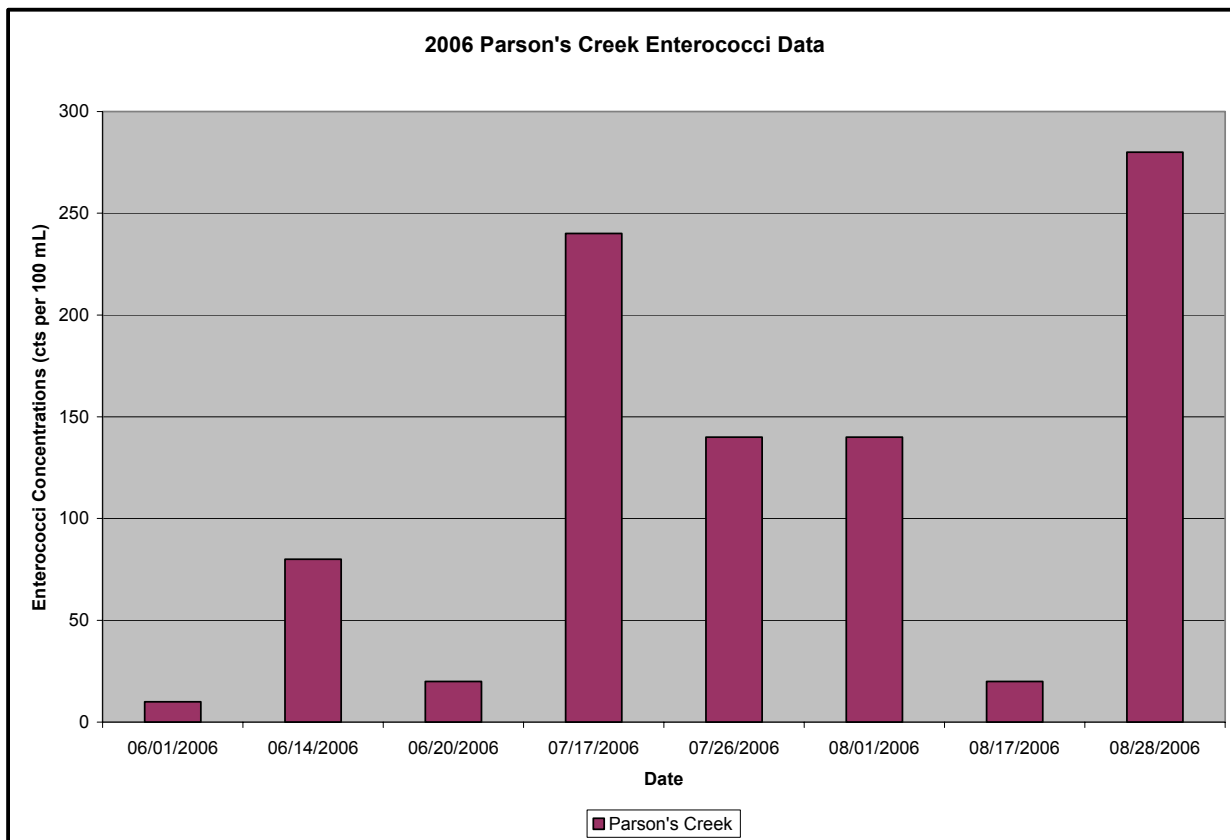


Figure 4. Parson's Creek Enterococci Data 2006

Figure 5 depicts the relationship between Precipitation and Enterococci levels at Parson's Creek in 2006.

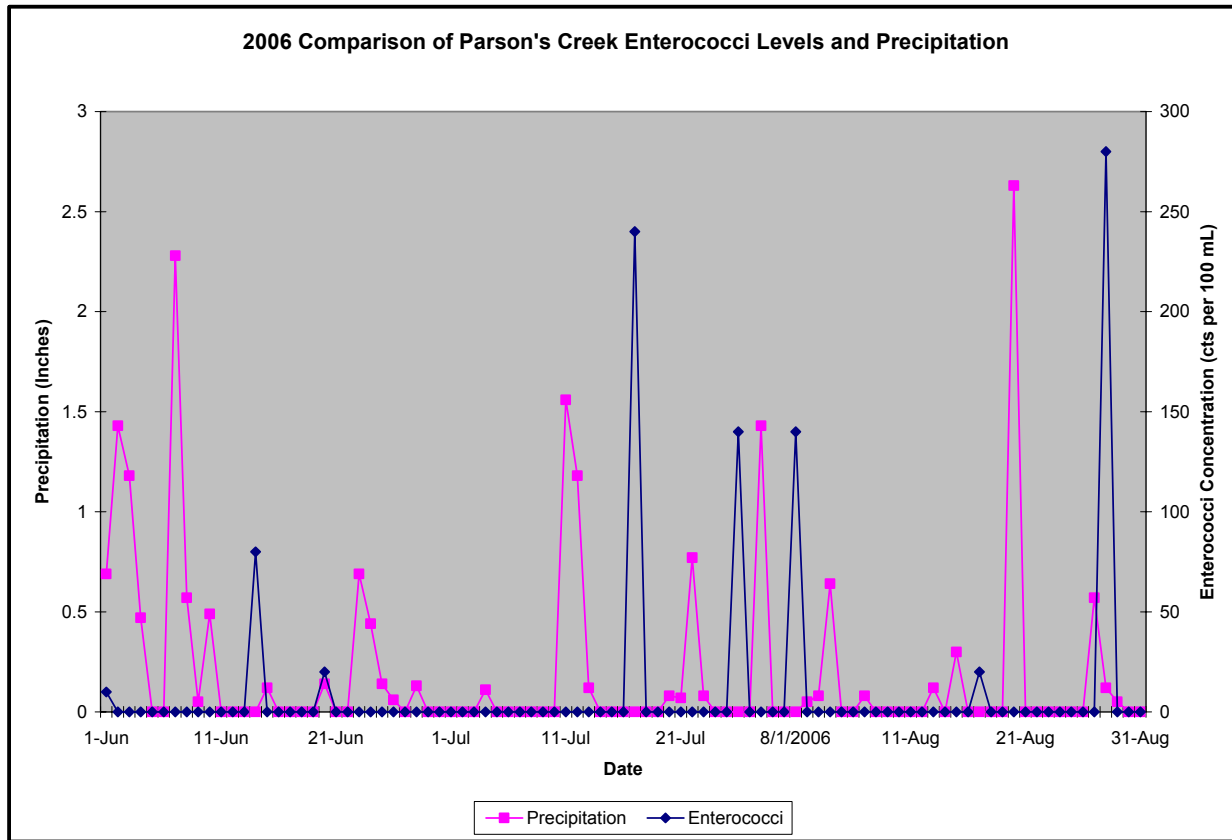


Figure 5. 2006 Comparison of Enterococci Levels and Precipitation at Parson's Creek

Areas of Concern

The prime area of concern at Pirate's Cove Beach is the bacteria load from Parson's Creek. Past studies have identified Parson's Creek as a significant pollution source to the Atlantic Coast, transporting and discharging bacteria laden waters to the ocean. A beach advisory was issued this summer as a result of the Parson's Creek discharge. The right beach station should be monitored regularly after precipitation events greater than 0.5 inches. A pre-emptive rainfall advisory may be warranted for the right side of Pirates Cove Beach. Further study is warranted to determine the relationship between bacteria loading and precipitation amounts. Children and domestic animals are often observed playing in Parson's Creek during the summer. Until additional human sources have been identified and mitigated from Parson's Creek, this area should be closed for recreation.

Thoughts for the Future

- The Town should restrict public access to Parson's Creek. The area on either side of the discharge should be roped off to discourage children from playing in the water. Also, signs should be posted to indicate the area may be unsafe for water contact due to potentially elevated levels of bacteria.
- The Beach Program applauds the Town and local residents for providing dog wastes bags for the public to pick up after their pets. This encourages dog owners to be responsible and properly dispose of waste. If the town should require additional pet waste stations, please contact Alicia Carlson at (603) 271-0698 or acarlson@des.state.nh.us.
- The Town of Rye, local businesses, or school group should participate in DES's Adopt-a-Beach Program. The program would consist of beach clean-ups and water quality monitoring. DES would conduct training sessions and participate in education and outreach activities for the community. If you are interested, please contact Alicia Carlson at (603) 271-0698 or acarlson@des.state.nh.us.
- A pre-emptive rainfall advisory may be necessary at Pirates Cove Beach. An analysis of historical rainfall and bacteria data may indicate a strong relationship between rainfall amounts and increased bacteria concentrations. Beach advisories would be predicated on determined bacteria levels as a result of precipitation amounts. Study results will be discussed with the beach manager.

Appendix A

Special Topic 2006

Rapid Assessment Methodology for the Detection of Microbiological Indicators

To assess beach water quality, the Department of Environmental Services (DES) monitors fecal indicator bacteria levels at coastal beaches on a routine basis. Unfortunately, results from sample analysis can take anywhere from 24 to 48 hours.

Because it takes at least 24 hours to receive results, beach managers and the public are not informed of water quality problems until after the public may have been exposed. This is an issue facing beach officials throughout the world, and is a priority of the US



Environmental Protection Agency (EPA). The EPA, universities and private entities are researching rapid assessment methods to enumerate bacteria and viruses. These methods will allow beach officials to post advisories on the same day water quality is impaired, thus, better protecting public health. There are three different rapid assessment method technologies available: Molecular surface recognition, nucleic acid detection and enzyme/substrate based methods. All rapid assessment methods will take less than two hours to obtain results.

Molecular surface recognition methods capture and/or label the target bacterium by binding to molecular structures on the exterior surface or in its genetic material. Analyses of coastal beach water samples currently employ culture-based methods for the detection of Enterococci bacteria, an indicator for fecal pollution in marine water. The quickest culture-based method takes up to 24 hours to provide results. Now, a new method is being developed to enumerate Enterococci. This new method uses Transcription-Mediated Amplification (TMA) with a fluorescently-labeled probe to amplify a specific region of Enterococci ribosomal RNA (rRNA).

The TMA rapid assessment method is currently being tested in Southern California. Method development is moving quickly and will likely come to execution within five years. Method cost is a significant reason the new technology is not currently being employed. Once this procedure is widely and routinely accepted, the expenses should lower. This rapid assessment method is very beneficial as it will allow beach managers to take immediate action towards protecting the public from waterborne pathogen exposure on the same day water is sampled.

Another rapid assessment method being developed for fecal indicator detection is Quantitative Polymerase Chain Reaction (QPCR). QPCR is a nucleic acid detection method that targets genetic material of bacteria, viruses or protozoan indicators. QPCR is used to test for both *E. coli* and Enterococci. Results can be obtained from this method on an average of two hours after sampling. This method has demonstrated 85-90 percent agreement with existing routine methods. QPCR can be used to detect other water quality indicators such as *Bacteroides*

thetaitamicron and human enterovirus. Studies indicate that ratios of *B. thetaitamicron* may provide useful information as to fecal contamination sources.

The final rapid assessment technology methods available are the enzyme/substrate based methods. These methods pair chromogenic or fluorogenic substrate methods already widely used with advanced optical or electrical detectors. These methods are directed at reducing the incubation periods of current membrane filtration methods. Some of these methods measure excitation and absorbance of the fluorescent metabolite of Enterococci using a fluorometer to speed the detection rate. A popular type of enzyme/substrate method is the Dual-Wavelength Fluorimetry (DWF).

These rapid assessments methods are currently being tested for accuracy, sensitivity and efficiency. Research indicates that these new methods will be made available within the next five years. Once these technologies are made available and laboratories adopt the methods, beach management will have a new tool to better protect public health. With assistance from EPA Beach Grants, New Hampshire will be proactive in employing accepted methods.